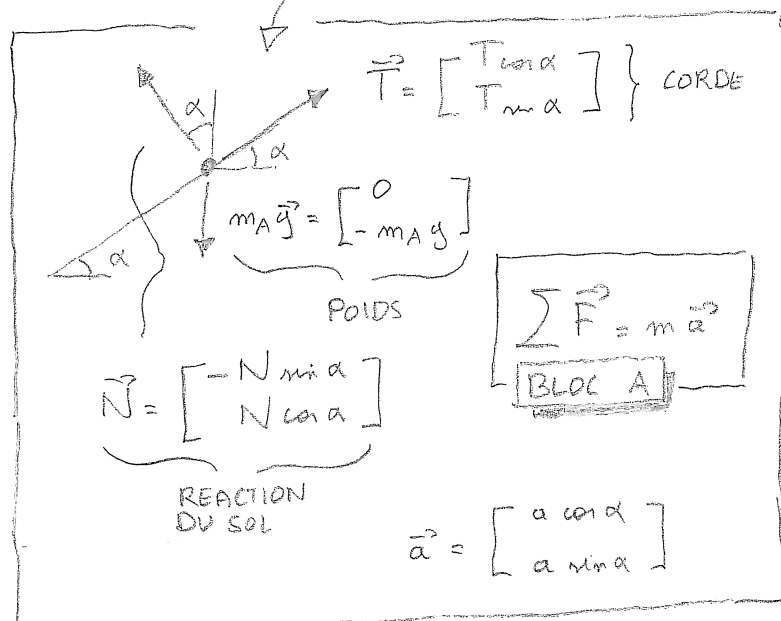
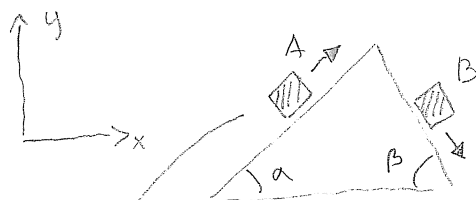
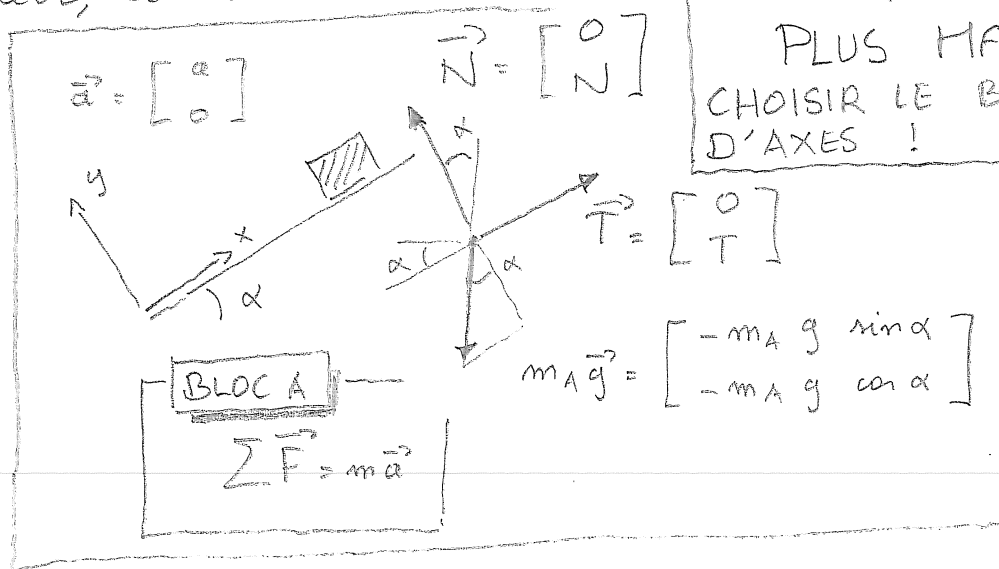


13



$$\begin{cases} -N \sin \alpha + T \cos \alpha & = m_A a \sin \alpha & (1) \\ N \cos \alpha + T \sin \alpha - m_A g & = m_A a \cos \alpha & (2) \end{cases}$$

OOOUUUUPPPSSS !!
COMPLIQUÉ, COMPLIQUÉ !

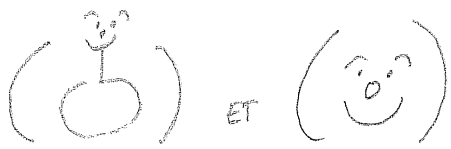


PLUS MALIN !
CHOISIR LE BON SYSTEME D'AXES !

$$\begin{cases} T - m_A g \sin \alpha & = m_A a & (3) \\ N - m_A g \cos \alpha & = 0 & (4) \end{cases}$$

ON RELIE
DIRECTEMENT
T ET a. SANS
CALCULER N !

$$a = \frac{T}{m_A} - g \sin \alpha \quad (5)$$

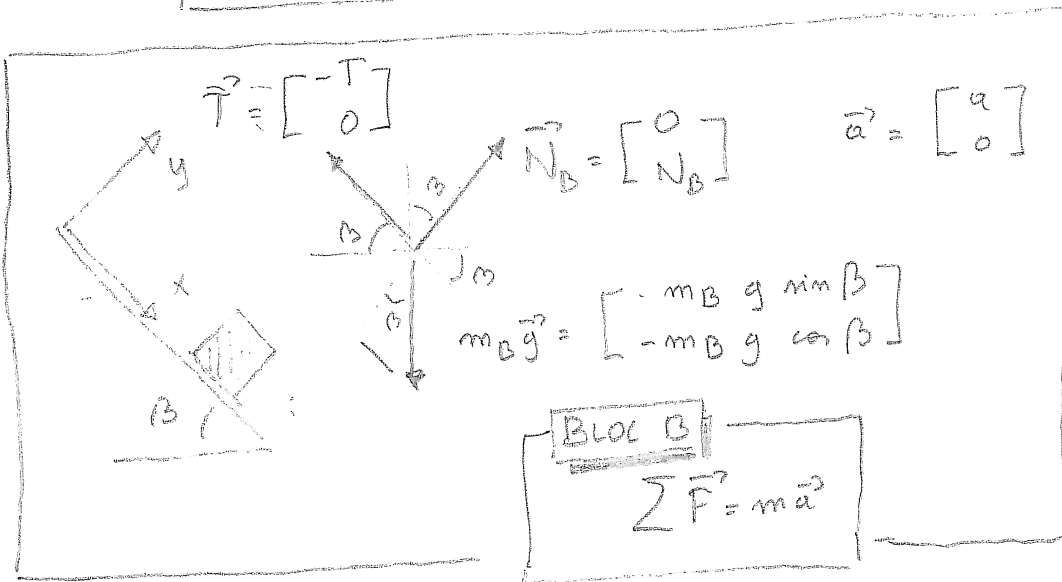


SONT STRICTEMENT EQUIVALENTES

C'EST LA MÊME EGALITE VECTORIELLE
EXPRIMEE DANS DEUX SYSTEMES D'AXES DIFFERENTS

VERIFIER !

$$\begin{aligned} (1) \cos \alpha + (2) \sin \alpha &= (3) \\ -(1) \sin \alpha + (2) \cos \alpha &= (4) \end{aligned} !$$



$$m_B a = -T + m_B g \sin \beta$$

$$a = g \sin \beta - \frac{T}{m_B} \quad (6)$$

- EN COMPARANT (5) ET (6)
MÊME VALEUR DE a

$$g \sin \beta - \frac{T}{m_B} = \frac{T}{m_A} - g \sin \alpha$$

$$g (m_B \sin \beta + m_A \sin \alpha) = T \left(\frac{1}{m_A} + \frac{1}{m_B} \right)$$

$$T = \frac{m_B m_A}{(m_B + m_A)} g (\sin \beta + \sin \alpha)$$

- EN COMPARANT (5) ET (6)
MÊME VALEUR DE T

$$m_A (a + g \sin \alpha) = m_B (g \sin \beta - a)$$

$$a = \frac{m_B g \sin \beta - m_A g \sin \alpha}{(m_A + m_B)}$$

VALEURS
NUMERIQUES

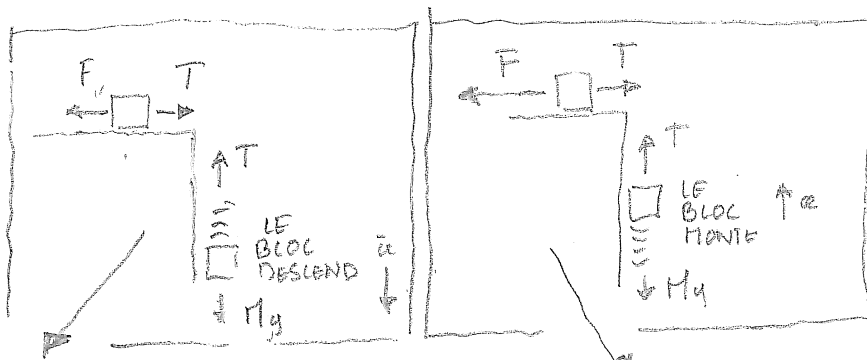
$$\alpha = 30^\circ$$

$$\beta = 60^\circ$$

$$T = \frac{30}{11} * 9,8 * \left(\frac{\sqrt{3}}{2} + \frac{1}{2} \right) = 36,5 \text{ [N]}$$

$$a = \frac{1}{11} * 9,8 * \left(6 \frac{\sqrt{3}}{2} - 5 \frac{1}{2} \right) = 2,4 \text{ [m/s}^2\text{]}$$

⚠ IL FAUT
CONNAITRE
LES VALEURS
REMARQUABLES
DES sin ET cos



$$\begin{cases} ma = T - F \\ Ma = Mg - T \end{cases}$$

$$F = 22 \text{ [N]}$$

$$a = 1 \text{ [m/s}^2\text{]}$$

$$\begin{cases} ma = F - T \\ Ma = T - Mg \end{cases}$$

$$F = 44 \text{ [N]}$$

$$a = 1,75 \text{ [m/s}^2\text{]}$$

$$(m+M)a = -F + Mg$$

1 22

$$(m+M)a = F - Mg$$

1,75 44

2 EQUATIONS

2 INCONNUES m ET M

$$\begin{cases} M(1 - 9,8) + m = -22 \\ M(1,75 + 9,8) + m \cdot 1,75 = 44 \end{cases}$$

$$\begin{cases} -8,8M + m = -22 & (1) \\ 11,55M + 1,75m = 44 & (2) \end{cases}$$

$$-1,75(1) + (2) \rightarrow 1,75 \cdot 8,8M + 11,55M = 1,75 \cdot 22 + 44$$

$$\begin{aligned} M &= 3,06 \text{ kg} \\ m &= 4,94 \text{ kg} \end{aligned}$$

NOTE

LE BLOC LE PLUS MASSIF EST m ET NON M :-)

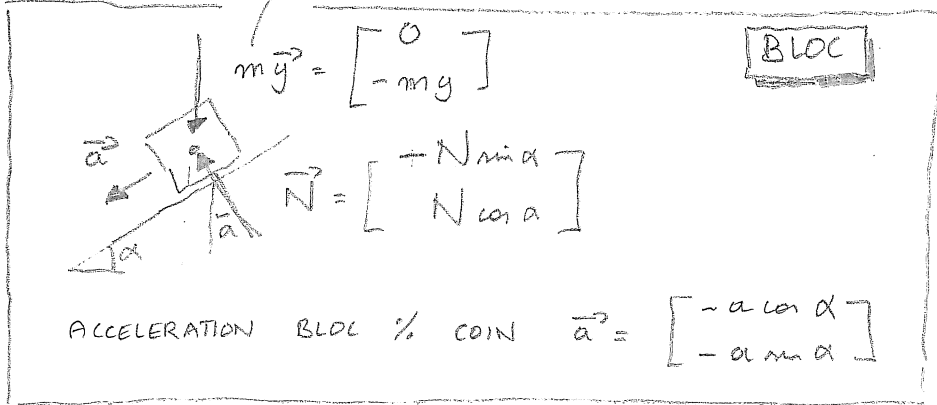
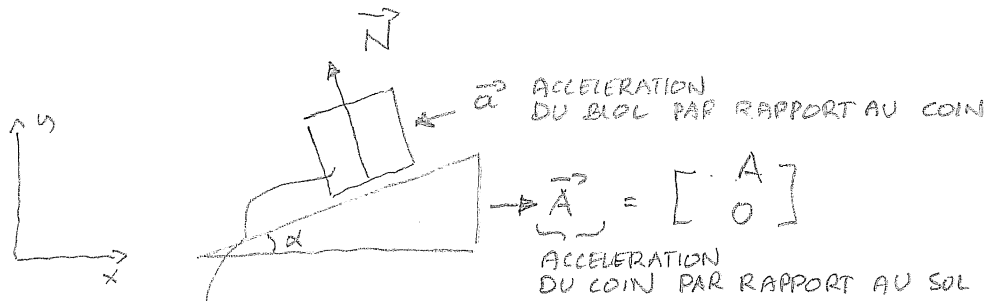
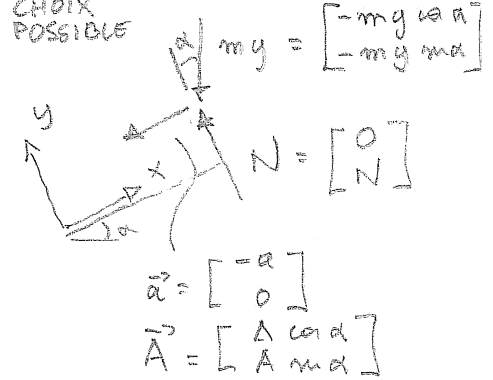
LES NOTATIONS PEUVENT ETRE CONTRE-INTUITIVES !
BE CAREFUL !

$$m = -22 + 8,8 \cdot 3,06$$

EN REPRENANT L'EQUATION (1)



15

AUTRE
CHOIX
POSSIBLE

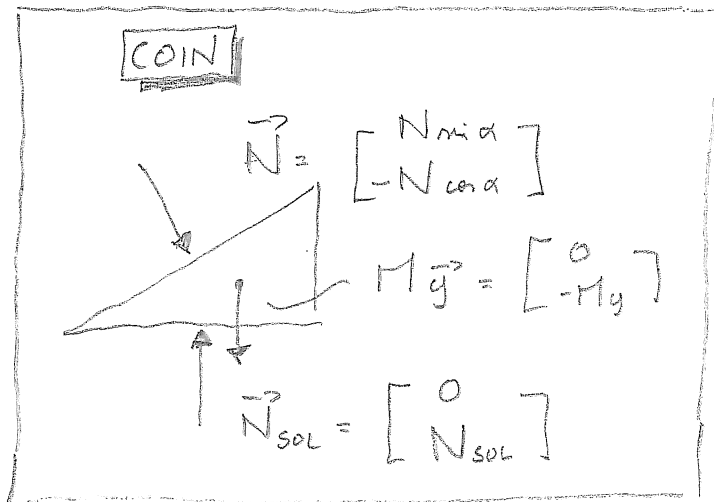
$\sum \vec{F} = m\vec{a}$

REPÈRE INERTIEL

SOL!

$$\begin{cases} -N \sin \alpha &= m (A - a \cos \alpha) \\ N \cos \alpha - mg &= m (-a \sin \alpha) \end{cases}$$

IL FAUT METTRE L'ACCELERATION DU COIN !



$$\begin{cases} N \sin \alpha = M A \\ -N \cos \alpha - Mg + N_{\text{sol}} = 0 \end{cases}$$

(PAS VRAIMENT UTILE SAUF POUR CONNAÎTRE N_{sol} NON DEMANDÉ ICI !)

3 EQUATIONS

A 3 INCONNUES

N, A et a

$$\begin{cases} -N \sin \alpha & = m(A - a \cos \alpha) & (1) \\ N \cos \alpha - mg & = -m a \sin \alpha & (2) \\ N m a & = M A & (3) \end{cases}$$

$$(1) + (3) \rightarrow (M+m)A = m a \cos \alpha \quad \left. \begin{array}{l} \text{EGALITE HORIZ} \\ \text{POUR ENSEMBLE} \\ \text{BLOC + COIN !} \end{array} \right\}$$

$$\cos(\alpha)(1) + \sin(\alpha)(2) \rightarrow \underbrace{-mg \sin \alpha}_{\text{EGALITE LE LONG DE LA DIRECTION OBLIQUE ! POUR LE COIN}} = \underbrace{m A \cos \alpha - m a}_{\text{EGALITE HORIZ POUR ENSEMBLE BLOC + COIN !}}$$

$$-mg \sin \alpha = m A \cos \alpha - \frac{(M+m)A}{\cos \alpha}$$

$$mg \sin \alpha \cos \alpha = \underbrace{-m A \cos^2 \alpha + m A}_{m A (1 - \cos^2 \alpha)} + M A$$

$\sin^2 \alpha$

$$A = \frac{mg \sin \alpha \cos \alpha}{M + m \sin^2 \alpha}$$

$$N = \frac{M mg \cos \alpha}{M + m \sin^2 \alpha}$$

CAR $N \sin \alpha = M A$!:-)

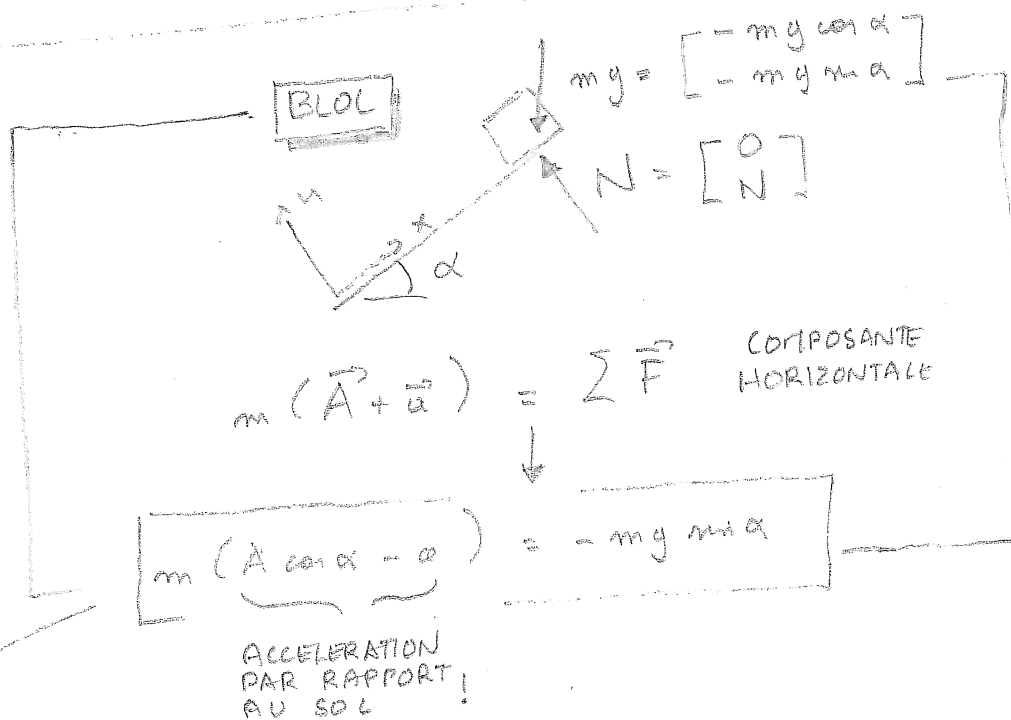
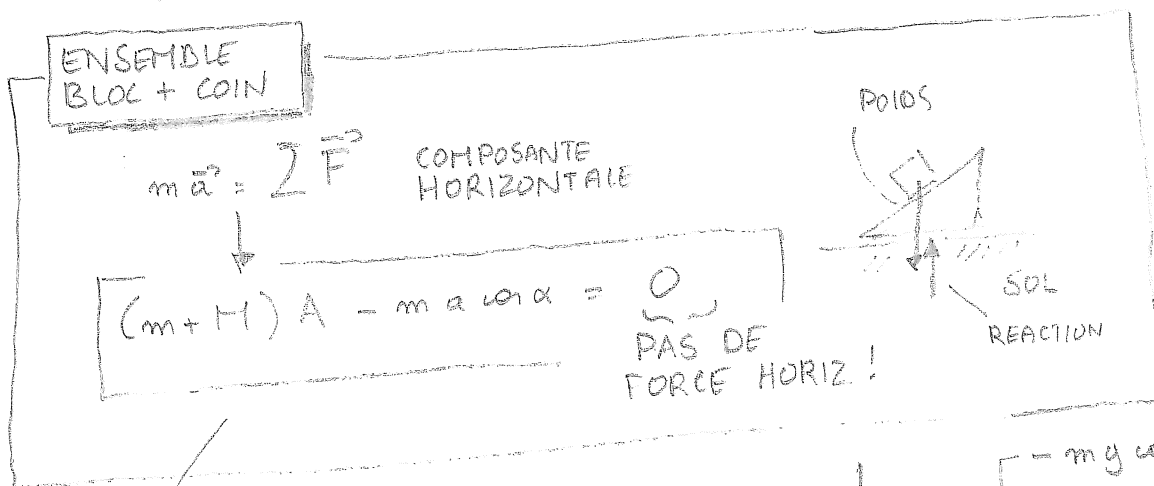
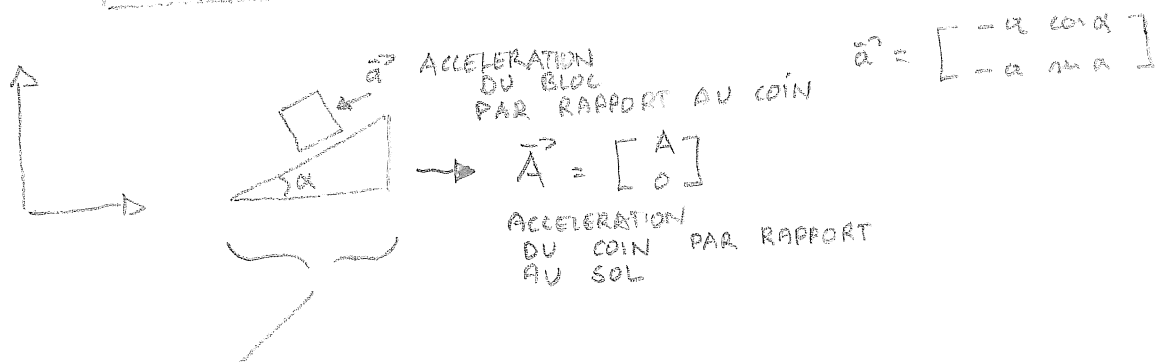
$$a = \frac{(M+m) g \sin^2 \alpha}{M + m \sin^2 \alpha}$$

CAR $m a \cos \alpha = (M+m) A$!:-)

15

PIECE OF CAKE ! :-)

THE FAST WAY



$$m A \cos \alpha - \frac{(M+m)}{\cos \alpha} A = -mg \sin \alpha$$

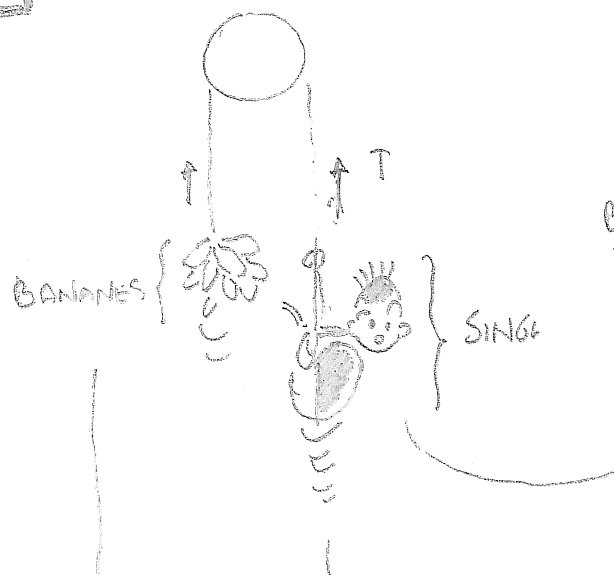
$$-m A \cos^2 \alpha + m A + M A = mg \sin \alpha \cos \alpha$$

$$m A (1 - \cos^2 \alpha) + M A = mg \sin \alpha \cos \alpha$$

$\sin^2 \alpha$

$$A = \frac{mg \sin \alpha \cos \alpha}{M + m \sin^2 \alpha}$$

16

BANANES
+ CORDEFORCE
EXERCÉE
SUR LA CORDELE SINGE
TIRE LA CORDEFORCE
MOTRICE
DE
TRACTIONDYNAMIQUE
DU SINGE

$$T - 10g = 10a$$

ACCELERATION
DU SINGE
PAR RAPPORT
A LA CORDELES
BANANES
MONTENTPOIDS
DES BANANES

$$\text{SI } T - 12g > 0$$

$$T > 12g$$

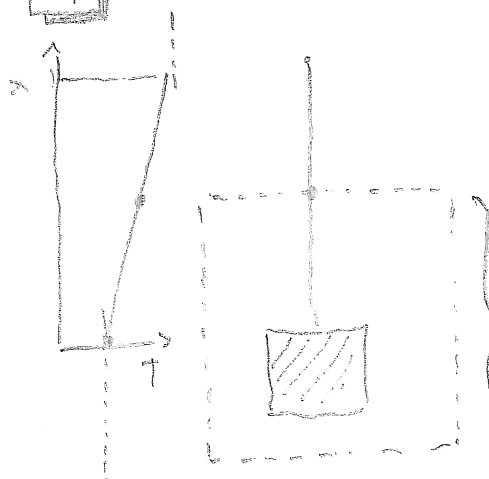
CONCLUSION

$$\text{IL FAUT } a > \frac{12g - 10g}{10}$$

$$1,96 \text{ m/s}^2$$

17

$$(M+m)(g+a)$$



CORPS

= 1/2 CORDE
+ BLOC

ON APPLIQUE NEWTON !

$$\vec{T} \quad \sum \vec{F} = (m/2 + M) \vec{a}$$

$$m/2 + M$$

$$(m/2 + M) \vec{g}$$

SI ON TIEN COMPTÉ
DU POIDS DE LA CORDE,
EN HAUT, LA TENSION REPREND
LE POIDS DU BLOC
ET DE LA CORDE !

$$T = \underbrace{(m/2 + M)}_{0,215} \underbrace{(g + a)}_{13,8}$$

$$= 2,97 \text{ N}$$